

RETAINER SLEEVE FOR TRANSMISSION GEAR AXLEBackground and Summary of the Invention

The present invention is directed to vehicle transmissions. More particularly, the present
5 invention is directed to a retainer sleeve which surrounds a differential carrier inside the transmission housing which keeps the axle for two of the spider gears from blowing a hole in the housing should the retention pin break, or otherwise become disengaged, from the axle.

A number of transmissions suffer from a common problem. An axle for a pair of spider gears is retained in place in the differential carrier by a fragile pin. This pin frequently breaks or otherwise
10 becomes disengaged allowing the axle to axially slide out of its housed position in the differential carrier. This often happens when the differential carrier is turning at speeds upwards of 5000 rpm. This will launch this axle at high velocity, impacting the transmission housing and knocking a hole in the wall of this cast aluminum part. This greatly exacerbates the damage caused by the axle being let loose and multiplies the expense to the vehicle's owner. This missile and the shrapnel it creates
15 can do additional damage to the vehicle, as well as pose a safety threat to the passengers of the car or truck.

While a number of transmissions have this problem, the particular transmission for which the retainer ring of the present invention has been designed is the 604 trans-axle, a transmission used on most all Chrysler minivans since 1988. In a transmission housing in which a fragile pin serves
20 as retention means for an axle for one or more spider gears in a differential carrier, the present invention comprises a sleeve which encircles the differential carrier at a point in which the axle is mounted for rotation in the differential carrier; means to attach said sleeve to a ring of a ring and pinion of the differential carrier; whereby when the fragile pin breaks, said sleeve retains the axle within the differential carrier preventing the axle from damaging the transmission housing.

25 The sleeve preferably comprises an annulus, or ring, which has a width at least as great as the diameter of the axle. This sleeve has a pair of legs extending from opposed edge portions of the

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annulus and each of the legs has a laterally extending foot. Each foot has a hole there through which overlies a bore in the ring of the differential carrier. When the bolts are inserted through the bores in the ring, the retaining sleeve is secured in position to prevent the axle from being launched into the side of the transmission housing when the retention pin breaks or is otherwise disengaged.

5 Various other features, advantages and characteristics of the present invention will become apparent to one of ordinary skill in the art after a reading of the following specification.

Brief Description of the Drawings

The preferred embodiment(s) of the present invention is/are described in conjunction with the associated drawings in which like features are indicated with like reference numerals and in which

5 **Fig. 1** is a view of a first embodiment of the retainer sleeve of the present invention shown mounted on the differential carrier;

Fig. 2A is a perspective view of the prior art differential carrier with the retainer sleeve removed to show additional details;

10 **Fig. 2B** is a perspective view of the prior art transmission housing showing the damage done to the housing when the retention pin breaks;

Fig. 3 is a perspective view of the retainer sleeve mounted on the differential carrier; and
Fig. 4 is a perspective view of the retainer sleeve off of the differential carrier.

Detailed Description of Preferred Embodiment(s)

The retainer sleeve of the present invention is shown in **Figs. 1, 3, 4** generally at **20**. As best seen in **Fig. 2A**, the differential carrier **11** has a bearing **13** on its upper end and a laterally extending flange **15** on its lower end with bores **16** there through by which it is bolted to the ring of a ring and pinion gear (not shown). Axle **17** mounts two spider gears **19, 19'** and is retained in place by pin **21** press fit in hole **21'** (**Fig 2A**). This pin **21** has a tendency to break or otherwise become disengaged as the transmission undergoes typical wear and tear. With the pin **21** missing, axle **17** becomes a missile launched at high rpm that can rip a hole in the transmission housing **23** (**Fig. 2B**). As seen in **Fig. 2B**, hole **25** in the transmission housing **23** is indicative of the type of damage that can result. Replacement of the housing **23** is the only viable option which significantly increases the cost of the repair.

25 The retainer sleeve comprises an annulus or ring **22** having a width 'w' at least as great as the diameter of axle **17**. A pair of legs **24** protrude from opposite edge portions of the annulus **22**,

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each with a foot **26** extending laterally over bores **16** and having a hole **28** therein generally of the same diameter as bore **16**. In this way, when the bolts (not shown) are inserted into bores **16** to secure the differential carrier **11** to the ring and pinion gear, the retention sleeve **20** is held in place thereabout. As best seen in **Fig. 4**, the annulus is flattened along the two lateral sides **30, 30'** for a tighter fit about the carrier **11**. Should the pin **21** break or otherwise become disengaged from axle **17**, retention sleeve **20** will prevent its exiting its mounting in the carrier **11**. The small width ‘**w**’ of the annulus **22** avoids interference with the lubrication of the spider gears within carrier **11**.

Various changes, alternatives and modifications will become apparent to one of ordinary skill in the art following a reading of the foregoing specification. It is intended that any such changes, alternatives and modifications as fall within the scope of the appended claims be considered part of the present invention.